



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/672,264	09/25/2003	William Dale Jones	SSI-08300	8802
28960 7590 12/22/2006 HAVERSTOCK & OWENS LLP 162 NORTH WOLFE ROAD SUNNYVALE, CA 94086			EXAMINER CHAUDHRY, SAEED T.	
			ART UNIT 1746	PAPER NUMBER
SHORTENED STATUTORY PERIOD OF RESPONSE 3 MONTHS		MAIL DATE 12/22/2006	DELIVERY MODE PAPER	

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/672,264

Applicant(s)

JONES, WILLIAM DALE

Examiner

Saeed T. Chaudhry

Art Unit

1746

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 September 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-38 is/are pending in the application.
- 4a) Of the above claim(s) 35-38 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-34 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>See Continuation Sheet</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restriction

Applicant's election of Group I, claims 1-34 in Paper No. 9/29/2006 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

The Specification

The disclosure is objected to because of the following informalities:

- 1) On page 4, line 29, "246" should be changed to 146.
- 2) On page 4, line 30, "237" should be changed to 137.
- 3) On page 8, line 12, "439" should be changed to 449.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

- (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
- (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
- (c) he has abandoned the invention.
- (d) the invention was first patented or caused to be patented, or was the subject of an inventor's certificate, by the applicant or his legal representatives or assigns in a foreign country prior to the date of the application for patent in this country on an application for patent or inventor's certificate filed more than twelve months before the filing of the application in the United States.
- (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.
- (f) he did not himself invent the subject matter sought to be patented.
- (g) before the applicant's invention thereof the invention was made in this country by another who had not abandoned, suppressed, or concealed it. In determining priority of invention there shall be considered not

Art Unit: 1746

only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other.

Claims 1-2, 5-7, 10-13, 15, 18-20, 22-26, 30-32 and 34 are rejected under 35 U.S.C. 102(b) as being anticipated by Athey.

Athey (3,646,948) discloses an apparatus for processing an object with a processing fluid having a processing chamber (14) formed within a chamber housing (10) and a fluid circulation loop integrally formed in the chamber housing.

FIG. 1 shows a typical front loading type dishwashing machine including an outer cabinet indicated generally at 10 which encloses a tank 11 having a bottom 12 and defining a wash chamber 14. The bottom 12 slopes downwardly towards the center so that the liquid collecting thereon drains into a sump 20 having a bottom wall 23. A main recirculating pump 25 is located within the sump 20 and has an inlet surrounded by an annular filter 26. The discharge of the pump 25 is connected to a conduit (not shown) which supports a rotatable reaction arm 28 having jet openings for spraying water upwardly over the articles supported by the racks 17.

The upwardly projecting shaft of the motor 32 drives the impellers of both the main recirculating pump 25 and the drain pump 30. Water is supplied to the chamber 14 through a fill line 35 which extends to a fill airgap 36 mounted on a sidewall of the tank 11. A pair of valves 38 and 40 each actuated by a corresponding solenoid 42, are mounted within the fill line 35, and both valves 38 and 40 have a common housing or body 44 which supports the two solenoids 42.

In operation, the motor 31 and the solenoids 42 of the fill valves 38 and 40 are automatically controlled according to a predetermined sequence or program by a motor driven

Art Unit: 1746

timer 50 supplied with electrical power from lines L.sub.1 and L.sub.2. Water is introduced into the chamber 14 by opening both of the fill valves 38 and 40. When a predetermined amount of water has been supplied to the chamber 14, fill valves 38 and 40 are closed. After the water is circulated by the main pump 25 for the desired length of time, fill valve 38 is opened which pressurizes passageway 52 thereby pressurizing the diaphragm actuator 48 which opens the drain valve 45 (see col. 2, lines 11-65).

The apparatus is capable of processing a semiconductor wafer. Athey discloses all the limitations as claimed herein. Therefore, Athey anticipate the claimed apparatus.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Shrinivasan et al in view of Ranft.

Shrinivasan et al (6,848,458) disclose an apparatus for processing semiconductor wafer, wherein a processing chamber (106) has inlet and outlet for the processing fluid and a circulation

loop (108) for circulating the processing fluid. The reference fails to disclose that the circulation loop is integrally formed in a chamber housing.

FIG. 1 shows a wafer cleaning system, 100, of the invention. Included in wafer cleaning system 100 are a solvent delivery mechanism 104 (within dotted line), a process vessel 106, a recirculation system 108, a depressurization system 110, and a recapture-recycle system 112. Solvent delivery mechanism 104 includes a liquid solvent source 102 and supercritical solution generator 103. In a preferred embodiment, solvent delivery mechanism 104 receives a sub-critical liquid solvent (for example liquid carbon dioxide) and converts it to a supercritical solution. The resulting solution is delivered to process vessel 106 (the heavy arrows in FIG. 1 depict supercritical fluid communication between solvent delivery mechanism 104, process vessel 106, recirculation system 108, and depressurization system 110; the fine arrows depict sub-critical fluid communication within apparatus 100). The supercritical solution contacts a wafer or wafers held within process vessel 106. The supercritical solution is recirculated through process vessel 106 (and over the wafer or wafers) via recirculation system 108 (see col. 7, line 51 through col. 8, line 3).

FIG. 5 shows an example recirculation system, 108 (within dotted line area), in fluid communication with the process vessel 106. Preferably, recirculation system 108 recirculates a supercritical solution through process vessel 106 such that a flow field is established over at least one surface of a wafer or wafers contained in process vessel 106. The flow field is mediated by at least (i) the dynamics of recirculation through recirculation system 108, (ii) the shape and design of the process cavity within process vessel 106, and (iii) the number and arrangement of flow plenums and manifolds in process vessel 106. Preferably,

Art Unit: 1746

recirculation system 108 includes valves for isolating the recirculating system from the process vessel (see col. 10, lines 1-13).

In its recirculation path, supercritical cleaning solution exits process vessel 106, traverses a shut-off valve 134, a filter 136, a pump 138, a static mixer 144, another filter 146, another shut-off valve 148, before re-entering process vessel 106. Valves 134 and 148 serve as isolation valves. Isolation valves are used to isolate the recirculation loop from the process vessel if desired. Filters 136 and 146 are used for removing any particulates that may be contained in the recirculating cleaning solution. Filter 136 is used to prevent particulates removed from the wafer surface from entering the recirculation system. Filter 146 is used to prevent particulates generated in the recirculation system (for example by the pump or precipitation of additives or removed wafer residues) from being deposited on the wafer (see col. 10, lines 32-45, Figs. 2, 5, 9 and 10).

Ranft (4,730,630) discloses an apparatus for processing objects, wherein a circulation loop having a pump, filter and manifold attached to a processing chamber and the circulation loop is integrally formed in a chamber housing (10).

It would have been obvious at the time applicant invented the claimed apparatus to include a chamber housing as disclosed by Ranft in the apparatus of Shrinivasan et al for the purpose of enclosing all the components of the Shrinivasan et al apparatus in a housing, which would enhance the portability of the apparatus and reduce the contaminations of the apparatus components. Further, it is well known in the art to make the apparatus components integral (see In re Lindberg, 93 USPQ 23 (CCPA 1952)).

Furthermore, Shrinivasan et al disclose to use check valves (162 and 168) in the additive delivery mechanism to prevent the back flow. Therefore, it would have been obvious at the time applicant invented the claimed apparatus to include a check valve in the circulation loop to prevent the back flow when the pump is not pumping the fluid. Injection ring as a manifold and heater for heating are well known in the art for injecting fluid in the chamber and heating the fluid. Therefore, it would have been obvious at the time applicant invented the claimed apparatus to include a injection ring for distributing the fluid in the chamber and heater for maintaining the fluid temperature in the circulation loop.

Claims 1-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over De Young et al in view of Ranft.

De Young et al (6,596,093) disclose an apparatus for processing semiconductor, wherein a processing chamber (51) has inlet and outlet for the processing fluid and a circulation loop for circulating the processing fluid. The reference fails to disclose that the circulation loop is integrally formed in a chamber housing.

During the manufacturing of an integrated circuit, a semiconductor wafer is cleaned after an etch step in the following process, FIG. 4, using dense phase carbon dioxide. Dense carbon dioxide is stored in pressure vessel (I) (50) at conditions of between 300 and 5000 psi and a temperature of between -20.degree. C. and 100.degree. C., further described as the high-pressure vessel. A wafer is loaded into cleaning chamber (III) (51) in an automated or manual fashion where the wafer is held on a platform (XI) (52) connected to a chuck and a sealed shaft (not shown) so that the platform can spin. Located above the wafer held on the platform is a

Art Unit: 1746

spray bar (X) (53) designed to disperse the flow of dense phase carbon dioxide and chemical adjuncts and to direct substantial fluid action onto the surfaces of the wafer. Cleaning chamber (III) is pressurized with clean carbon dioxide from either a bulk storage tank (XII) (54) through valve (i) (55) or from pressure vessel (I) (50) through valve (a) (56) to a pressure of between 300 psi and 5000 psi at a temperature of between -20.degree. C. and 100.degree. C. The temperature of the dense CO.sub.2 can be modulated using heat exchanger (II) (60).

Additionally, the temperature of the processing phase in chamber (III) (51) can be modulated using heat exchangers internal or external to the chamber. Highly filtered chemical adjuncts as required are added to cleaning chamber (III) (51) from adjunct addition module (VI) (61) through valve (b) (62) during the addition of dense CO.sub.2 or alternatively prior to the addition of the dense CO.sub.2. The adjunct addition module serves to store, filter, mix and sequentially or simultaneously meter adjunct materials to the cleaning chamber. During the cleaning process, the dense phase CO.sub.2 is optionally circulated from the cleaning chamber through valve (e) (66) using pump (VII) (63) through solid separation filter (VIII) (64) and valve (f) (65) back into the chamber through the spray bar (X) (53). During the circulation the wafer can be spun at rates between zero and 3000 rpm. Also during the cleaning step, the density of the system is cyclically modulated. This can be accomplished with the following sequence. Pressure vessel (I) (50), the high-pressure vessel, containing dense CO.sub.2, is maintained at a pressure notably above (50 to 2000 psi greater than) that of cleaning chamber (III) (51). Pressure vessel (V) (70), low-pressure vessel, is held at a pressure notably less than (50 to 3000 psi lower than) cleaning chamber (III) (51), and the temperature of the independent vessels are roughly the same. In the cyclical process, valve (a) (56) is first

Art Unit: 1746

opened to allow for the flow of mass between (I) and (III) then closed. Valve (d) (71) is then opened to allow for the flow of mass between (III) and (V). Valve (g) (72) is then opened to separator/abatement module (IX) (73) such as a filter or other separator that serves to separate chemical adjuncts from CO.sub.2 and removed waste. The abatement module also allows for removed CO.sub.2 mass to be re-added to tank (I) through valve (h) (74) completing the mass flow cycle. Alternatively, CO.sub.2 mass can be added to pressure vessel (I) from bulk storage, to reestablish higher pressure in vessel (I) than chamber (III). This mass flow cycle is repeated multiple times (between 1 and 500) in a given cleaning cycle resulting in cyclical phase modulation (CPM). Dense CO.sub.2 circulation in cleaning chamber (III) can optionally be augmented using pump (VII) and valves (e) and (f) during CPM. During the cleaning step, CPM can be alternatively achieved using variable volume chamber (IV) (80) with valve (c) (81) opened. In this scenario, the volume of (IV) is increased and reduced cyclically, between 1 and 500 times in a given cleaning cycle. In this CPM scenario, fluid can optionally be circulated through the cleaning chamber (III) using pump (VII) and valves (e) and (f). After a period sufficient to remove the contaminants from the surface of the wafer, dense phase CO.sub.2 mixture is flushed from the system through valve (d) into vessel (V) with addition of pure dense phase CO.sub.2 from tank (I) through valve (a). This rinse process continues until all adjunct and waste are removed from the chamber. The dense CO.sub.2 is vented from cleaning chamber (III) to a waste or abatement system.

Ranft (4,730,630) discloses an apparatus for processing objects, wherein a circulation loop having a pump, filter and manifold attached to a processing chamber and the circulation loop is integrally formed in a chamber housing (10).

It would have been obvious at the time applicant invented the claimed apparatus to include a chamber housing as disclosed by Ranft in the apparatus of De Young et al for the purpose of enclosing all the components of the De Young et al apparatus in a housing, which would enhance the portability of the apparatus and reduce the contaminations of the apparatus components. Further, it is well known in the art to make the apparatus components integral (see In re Lindberg, 93 USPQ 23 (CCPA 1952)).

Furthermore, check valves are well known in the art for unidirectional fluid flow. Therefore, it would have been obvious at the time applicant invented the claimed apparatus to include a check valve in the circulation loop to prevent the back flow when the pump is not pumping the fluid. Injection ring as a manifold and heater for heating are well known in the art for injecting fluid in the chamber. Therefore, it would have been obvious at the time applicant invented the claimed apparatus to include a injection ring for distributing the fluid in the chamber.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Saeed T. Chaudhry whose telephone number is (571) 272-1298. The examiner can normally be reached on Monday-Friday from 9:30 A.M. to 4:00 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Michael Barr, can be reached on (571)-272-1414. The fax phone number for non-final is (703)-872-9306.

When filing a FAX in Gp 1700, please indicate in the Header (upper right) "Official" for papers that are to be entered into the file, and "Unofficial" for draft documents and other communication with the PTO that are for entry into the file of the application. This will expedite processing of your papers.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (571) 272-1700.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published

Art Unit: 1746

applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Saeed T. Chaudhry
Patent Examiner

A handwritten signature in black ink, appearing to read "Michael Barr", with a stylized, sweeping underline.

MICHAEL BARR
SUPERVISORY PATENT EXAMINER

Continuation of Attachment(s) 3. Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :11/20, 11/01, 10/16, 7/19, 7/12, 4/24, 3/29/2006; 12/13, 11/02, 10/24, 8/15, 7/18, 5/25, 5/12, 4/8, 2/14, 1/19, 1/10/2005; 12/16, 6/24, 1/8, 1/2/2004.